

Title: Crazy Quilts**Brief Overview:**

Students will travel back to the pre-Civil War period to discover how a young African-American girl used creativity, math, and geography skills to gain her freedom. Students will create a quilt using fractions, decimals, percents, and geometry.

Links to NCTM Standards:

- **Mathematics as Problem Solving**

In a cooperative setting students will demonstrate problem solving by using specified criteria to design a quilt.

- **Mathematics as Communication**

Students will write a letter to the author explaining in mathematical terms and symbols how they designed and created a quilt. They will also be communicating within their cooperative groups as they share their individual designs.

- **Mathematics as Reasoning**

Students will be asked to creatively design geometric figures on a grid. Each design must meet specified mathematical criteria.

- **Mathematical Connections**

Through the use of reading material, students will be able to relate history, geography, mathematics, language arts, and art. Follow-up activities will be provided to enhance the integration of the disciplines.

- **Number Sense and Numeration**

Given criteria, students will calculate the fractional parts of a set. In the process of creating their square, students will be required to interrelate fractions, decimals, and percents.

- **Geometry and Spatial Sense**

Students will demonstrate an ability to use symmetry in the process of duplicating a pattern. Students will use wooden pattern blocks to explore possible designs to be incorporated in their projects.

- **Fractions and Decimals**

Students will use fractions, decimals, and percents in calculating the variance in colors on a grid. They will need to determine the appropriate amounts, shapes, and colors based on their mathematical calculations.

- **Patterns and Relationships**

Through the use of colorful geometric shapes and mathematical calculations, students will create a pattern and will be required to reproduce the design in a symmetrical manner.

Grade/Level:

Grade 5

Duration/Length:

5 class days

Prerequisite Knowledge:

Students should have working knowledge of the following skills:

- Symmetry
- Multiplication of Fractions
- Decimals
- Percent
- Grids/quadrants

Objectives:

Students will:

- use percent to cooperatively determines patterns for a quilt.
- use their knowledge of symmetry to duplicate a pattern.

Materials/Resources/Printed Materials:

- Sweet Clara and the Freedom Quilt by Deborah Hopkinson
- Pattern Blocks
- Make It Symmetrical worksheet (Student Resource 1) - One per student
- Calculators - One per student
- Cool Calculations Worksheet (Student Resource 2) - One per student
- Cool Calculations Worksheet Key (Teacher Resource 3)
- 10 x 10 grid paper (Student Resource 4) - One per student
- Writing Paper
- Scoring Rubric for Letter (Teacher Resource 6)
- Scoring Rubric for Quilt Square (Teacher Resource 5)
- Transparencies of Student Resource 1 and Student Resource 2

Development/Procedures:

You have just read Sweet Clara and the Freedom Quilt by Deborah Hopkinson. Engage your students in a discussion of the history of slavery, the art of quilt making, and the relationship of patterns to quilts.

Day 1

- Read Sweet Clara and the Freedom Quilt.
- Discuss the following:
 - history of slavery
 - the art of quilting
 - the relationship of patterns and quilts.
- Divide students into groups of three to four.
- Distribute wooden pattern blocks and instruct the students to complete the "Make It Symmetrical" Worksheet (Student Resource 1).
- Informally assess students' knowledge of symmetry.
- Have students display and share their designs with the class.

Day 2

- Display transparency of 10 x 10 grid on the overhead (Student Resource 4).
- Explain to students that today a design will be made in quadrant I (top right).

- Inform the students that 40% of the design must be red, 20% blue, and 40% yellow.
- Distribute “Cool Calculations” Worksheet (Student Resource 2) and calculators.
- Complete the worksheet with students. (Teacher Resource 3)
- Teacher should draw a multicolor design which must include the color and percentages above. **(Teacher should draw design against the dark vertical line of the grid.)**
- Distribute the 10 x 10 grid paper (Student Resource 3) to each student.
- Have the students replicate the design on the paper.
(Note: Collect all worksheets for reference on Day 3.)

Day 3

- Distribute student worksheets from Day 2.
- Divide students into pairs.
- Inform the students that they will work in pairs to calculate and make a design.
- Evaluate the design to meet the following criteria:
 - three different colors
 - the following proportions included: 60%, 20%, and 20%.
- Place the design in quadrant II (bottom right).
- Have each student draw the design on his/her grid.
- Have students share their designs.
(Note: Collect the grid for use on Day 4.)

Day 4

- Distribute the grid to all students.
- Review the designs on the “Make It Symmetrical” worksheet on display from Day 1
- Inform the students that they will make the symmetrical designs of the figures on their grids.
- Prepare a wall area where the students can put the grids together to create a class quilt.

Day 5

- Have students write a letter to the author of Sweet Clara and the Freedom Quilt.
- Have students express their comments about the story and explain the quilt making activity.

Performance Assessment:

The following are a suggested time frame for assessing student activities.

Day 1:

Evaluate “Make It Symmetrical” worksheet (Student Resource 1) to assess students’ knowledge of symmetry

Day 2:

Informally assess students’ knowledge of symmetry and replicate information presented by teacher.

Day 3:

Evaluate the lower half of the “Cool Calculations” worksheet (Student Resource 2) using rubrics. (Teacher Resource 5)

Day 4:

Evaluate students ability to draw a symmetrical figure.

Day 5:

Evaluate the letter using Teacher Resource 6.

Extension/Follow Up:

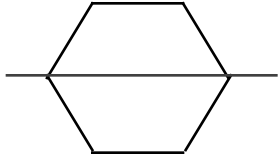
- Students can make a quilt using fabric.
- Students can write and invite a speaker from a local quilt club.
- Students can research the history of quilting.
- Students can make a quilt square on a 12 cm x 12 cm grid using the following proportions:
Quadrant I: 50% green; 25% red; and 25% blue
Quadrant II: 33 1/3% one color and 66 2/3% another color
Draw symmetrical design in quadrants III and IV.

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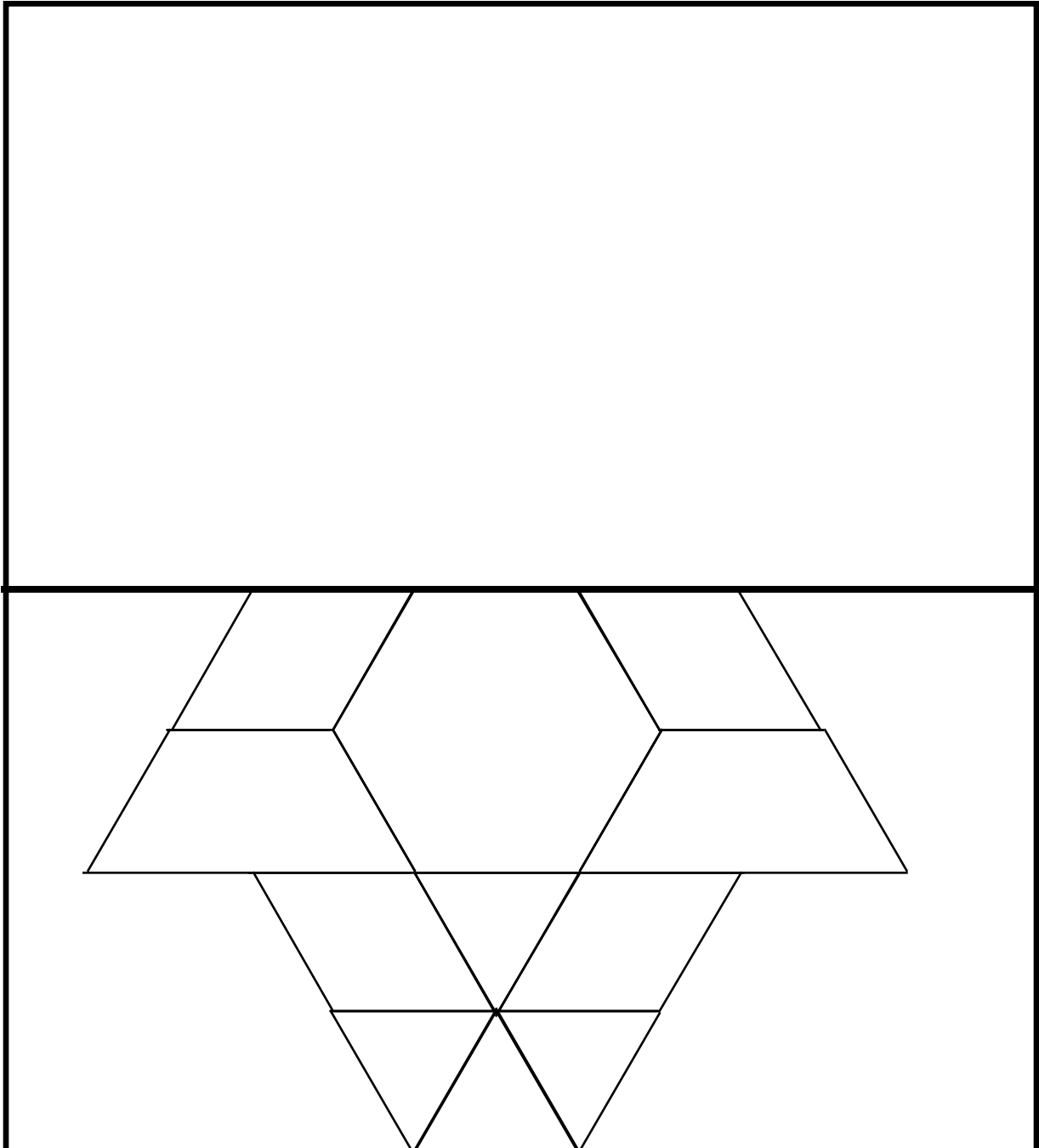
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Make It Symmetrical



Directions:

- 1) Color in the design given below the line with the colors of actual pattern blocks.
- 2) Use pattern blocks to complete the design above the line. Be sure it will reflect the design below the line.
- 3) Trace and color the pattern blocks you chose.
- 4) Use the string given to determine if there are any other lines of symmetry in the design.
- 5) Write about what you discovered.



Cool Calculations

Student Resource 2

1) _____ % = $\frac{\quad}{100}$

2) Reduce to lowest terms $\frac{\quad}{100}$ = _____

3) Number of blocks in quadrant _____

4) _____ x _____ = _____
(answer from #2) (answer from #3) (Number of blocks to be colored)

1) _____ % = $\frac{\quad}{100}$

2) Reduce to lowest terms $\frac{\quad}{100}$ = _____

3) Number of blocks in quadrant _____

4) _____ x _____ = _____
(answer from #2) (answer from #3) (Number of blocks to be colored)

Cool Calculations

Teacher Resource Sheet 3

1) $\underline{\quad 40 \quad} \% = \frac{40}{100}$

2) Reduce to lowest terms $\frac{40}{100} = \frac{2}{5}$

3) Number of blocks in quadrant $\underline{\quad 25 \quad}$

4) $\frac{2}{5} \times \underline{\quad 25 \quad} = \underline{\quad 10 \quad}$
(answer from #2) (answer from #3) (Number of blocks to be colored)

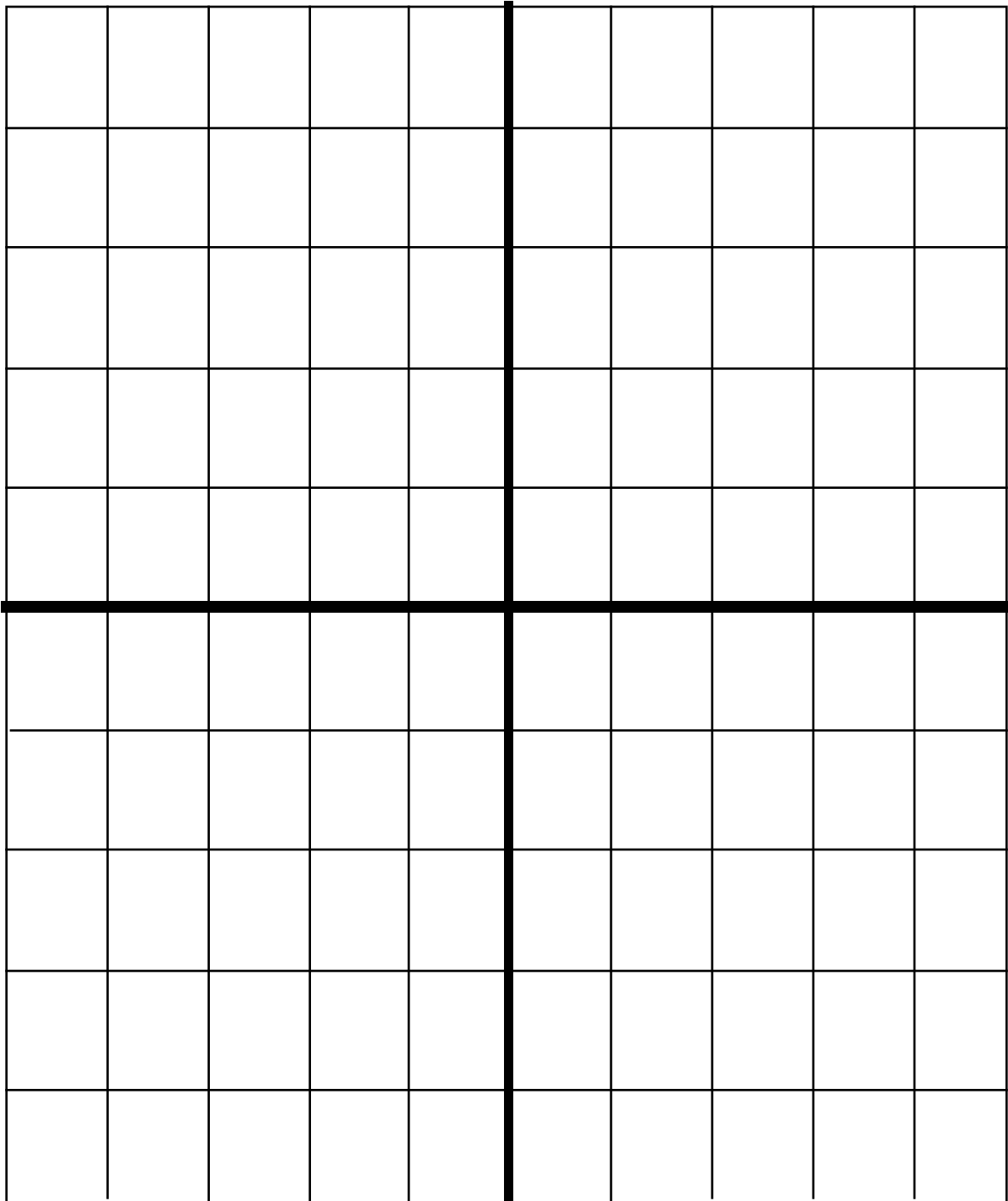
1) $\underline{\quad 60 \quad} \% = \frac{60}{100}$

2) Reduce to lowest terms $\frac{60}{100} = \frac{3}{5}$

3) Number of blocks in quadrant $\underline{\quad 25 \quad}$

4) $\frac{3}{5} \times \underline{\quad 25 \quad} = \underline{\quad 15 \quad}$
(answer from #2) (answer from #3) (Number of blocks to be colored)

10 x 10 GRID



Scoring Rubric for Quilt Square

3 points

Quilt square design meets all measurement criteria.
All measurements, formulas, and algorithms are accurate.
Math reasoning and thinking are clear and correct.
Written work is neat and organized and utilizes proper math language.

2 points

Quilt square designs meet most of the measurement criteria.
Most measurements, formulas, and algorithms are accurate.
Math reasoning and thinking are clear and mostly correct.
Written work is neat and organized and utilizes proper math language.

1 point

Quilt square designs meet some of the measurement criteria.
Some of the measurements, formulas, and algorithms are correct.
Some math reasoning and thinking are clear and correct.
Written work is legible and has some organization.

0 points

Quilt square design does not meet measurement criteria.
Very few of the measurements, formulas, and algorithms are accurate.
There is little evidence of math reasoning.
Written work is unorganized.

Scoring Rubric for Writing

4 points

Uses correct friendly letter format .
Uses purposeful and accurate information to fully explain the topic.
Consistently uses correct grammar, mechanics, and spelling.
Effective language choices are used to inform intended audience.

3 points

Uses correct friendly letter format.
Language choices are effective for informing intended audience.
Uses correct grammar, mechanics, and spelling with very few errors.
Uses purposeful and mostly accurate information to explain the topic.

2 points

Omits one part of the friendly letter format.
Several errors observed in grammar, mechanics, and spelling.
Language choices are adequate for informing intended audience.
Uses purposeful and some accurate information to explain topic.

1 point

Omits more than one part of the correct letter format.
Writing does not address the needs and characteristics of intended audience.
Infrequent use of correct grammar, mechanics, and spelling.
Rarely uses purposeful or accurate information to explain topic.

0 point

None of the above criteria are met.